SOCIETY OF ACTUARIES®

Strategic Decision Making Exam

Exam CFESDM

Date: Thursday, April 28, 2022

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This examination has 4 questions numbered 1 through 4 with a total of 100 points.

   The points for each question are indicated at the beginning of the question. All questions pertain to the Case Study.

2. While every attempt is made to avoid defective questions, sometimes they do occur. If you believe a question is defective, the supervisor or proctor cannot give you any guidance beyond the instructions provided in this document.
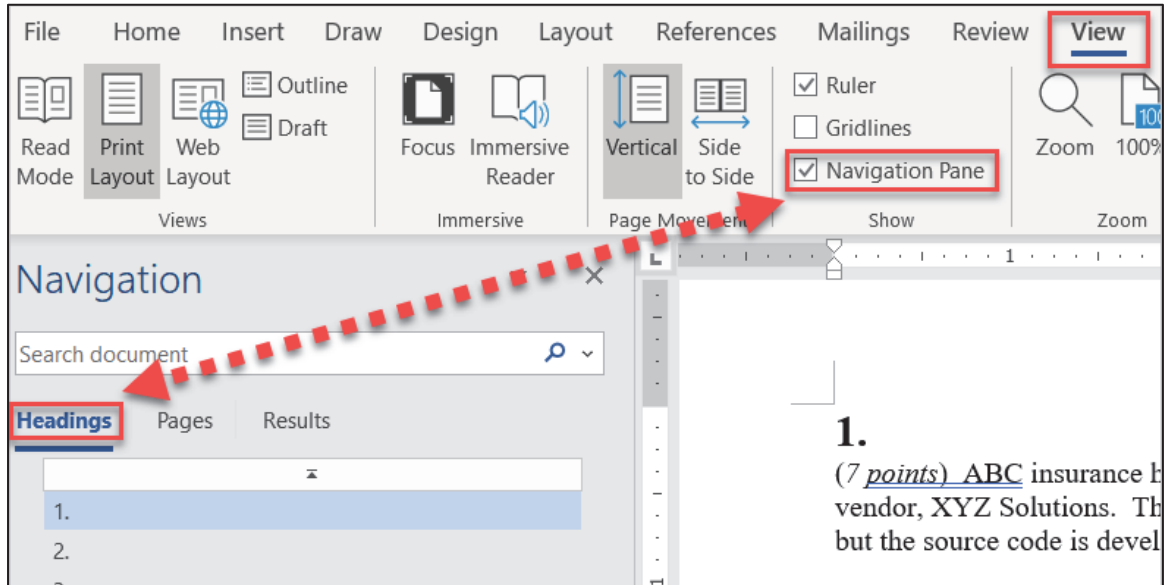
Written-Answer Instructions

1. Each question part or subpart should be answered either in the Word document or the Excel file as directed. Graders will only look at work in the indicated file.

   a) In the Word document, answers should be entered in the box marked ANSWER. The box will expand as lines of text are added. There is no need to use special characters or subscripts (though they may be used). For example, β_1 can be typed as beta_1 (and ^ used to indicate a superscript).

   b) In the Excel document formulas should be entered. Performing calculations on scratch paper or with a calculator and then entering the answer in the cell will not earn full credit. Formatting of cells or rounding is not required for credit.

   c) Individual exams may provide additional directions that apply throughout the exam or to individual items.

2. The answer should be confined to the question as set.

3. Prior to uploading your Word and Excel files, each file should be saved and renamed with your five-digit candidate number in the filename.

4. The Word and Excel files that contain your answers must be uploaded before the five-minute upload period expires.

Navigation Instructions

Open the Navigation Pane to jump to questions.

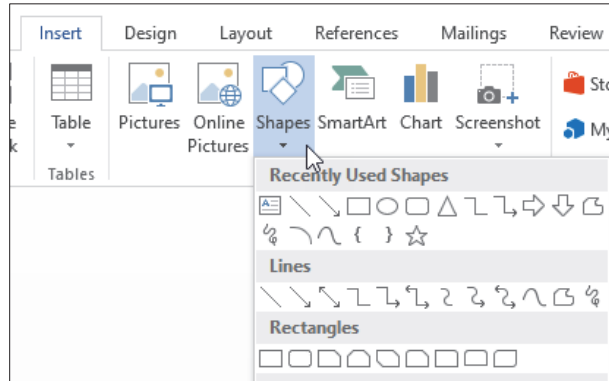Press Ctrl+F, or click View > Navigation Pane:
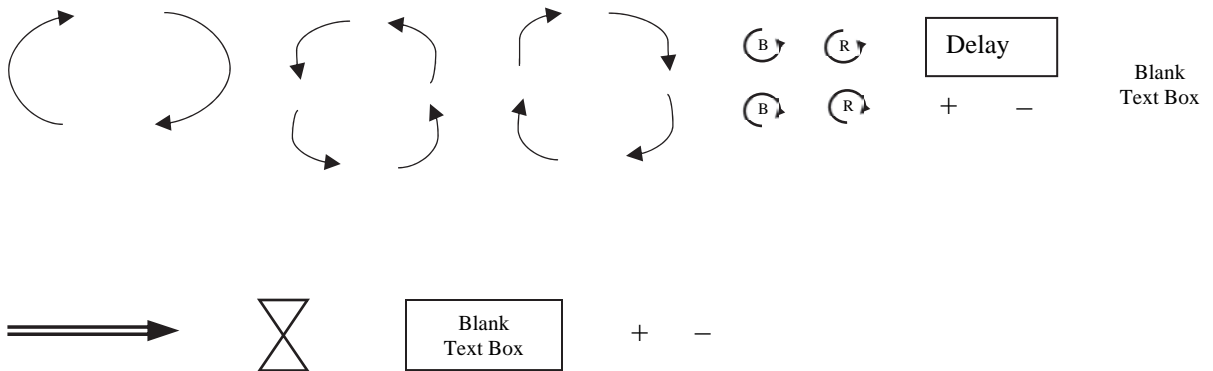
CASE STUDY INSTRUCTIONS

The case study will be used as a basis for some examination questions. Be sure to answer the question asked by referring to the case study. For example, when asked for advantages of a particular plan design to a company referenced in the case study, your response should be limited to that company. Other advantages should not be listed, as they are extraneous to the question and will result in no additional credit. Further, if they conflict with the applicable advantages, no credit will be given.

Drawing Models in a CBT Setting

The following shapes are commonly used when modelling dynamic process and complex systems, such as those in *Business Dynamics* (Sterman, John D., 2000). Not all shapes may be needed, nor should this be considered an exhaustive list of possible shapes. Candidates may copy, paste, and manipulate shapes to answer questions where a sketch is required. For reference, candidates can also insert a variety of shapes using either Microsoft Excel or Microsoft Word under the insert menu:

Selected shapes used in Business Dynamics:

1.

(*20 points*) Information on Big Ben can be found in section 5 of the case study.

Big Ben senior management is considering next year's funding goals for the four strategic initiatives: digital banking, cryptocurrency, the insurance opportunity with Darwin, and solar energy financing. Management faces both conflicting demands and limited resources. They decide to focus on making incremental changes from the previous year's expenditure level to set next year's budget.

(a)   (*2 points*) List the shortfalls under this budgeting approach.

> ANSWER:

There are five Quest categories related to change management that compose a corporate transformation.

(b)   (*6 points*) Identify all applicable Quest categories for each of the four strategic initiatives. Justify your answers.

> ANSWER:

Big Ben management feels that digital banking and cryptocurrency are the two best options. They wish to use the Zero-Based Budgeting approach (ZBB) to help answer the question "If we can only implement either Digital *or* Crypto, which should we choose?"

There are Five Key Elements of Zero-Based Budgeting.

(c)   (*4 points*) Apply each element of ZBB within the context of the two alternatives.

> ANSWER:

(d)   (*1 point*) Explain what is wrong with management's use of ZBB.

> ANSWER:

1. Continued

(e) (*4 points*) Management wants to maximize Big Ben's 5-year income from their investment. If the initiative is unsuccessful, it will merely break even over five years. Ignore effects of time value of money.

Item	Initiative	Initial investment ($M)	Annual Income ($M)	# of internal departments impacted	Overall Probability of success
1	Digital banking	9	2	8	60%
2	Crypto	13	2.5	5	30%

(i) (*1.5 points*) Develop a metric that best compares the initiatives. Justify your answer.

ANSWER:

(ii) (*1 point*) Calculate the metric for each initiative.

ANSWER:

(iii) (*0.25 points*) Rank the initiatives by order of preference.

ANSWER:

(iv) (*1.25 points*) Interpret the results of the ranking.

ANSWER:

1. Continued

Big Ben management has determined that, due to the growth of FinTech firms, expanding its digital banking presence is the only strategic initiative that will receive funding.

Regarding the Market Analysis for Neobanks, Mr. Patel argues "under ZBB approach, although the identification and evaluation of the minimum level of effort is the most challenging element, we can assume 75 percent of the current funding level is ideal for the Big Ben expansion strategy."

(f) (*1 point*) Explain two important reasons for defining a minimum level of funding for the digital banking initiative.

> ANSWER:

(g) (*2 points*) Critique Mr. Patel's statement.

> ANSWER:

2.

(*21 points*)

(a)   (*0.5 points*) Define Corporate Performance Management.

> ANSWER:

Information on Seaplane Expeditions and Aviation Company (SEA) can be found in section 8 of the case study.

SEA has retained the services of a consultant with experience in the transportation sector in China. The consultant has proposed an expansion plan as follows:

SEA will utilize Corporate Performance Management (CPM) to monitor the performance of the expansion plan only. The following goals and measurements plan has been proposed.

Strategy: Expand Service into China

Tactics and Goals	Measures	Dimension	Frequency
Maintain safety record	Safety incidents	By route	Monthly
Service 100,000 passengers	Passenger		

Internal Threats	Leading Indicators to Monitor
Supply of pilots	Number of Tickets sold
Supply of maintenance staff	

(b)   (*3 points*) Critique SEA's proposed expansion plan with respect to CPM.

> ANSWER:

The consultant has reviewed attempts by other companies to expand into foreign countries. In every case, the company's local culture adapts to the new country. The consultant is concerned that this adaptation has not been considered in SEA's proposed plan above.

(c)   (*5 points*) Critique SEA's proposed expansion plan based on the Five Principles to Help Cultural Changes Stick.

> ANSWER:

2. **Continued**

(d)   (*2 points*) Recommend two changes to SEA's proposed expansion plan based on your assessment in (c). Justify your answer.

> ANSWER:

SEA's data shows that as the tenure of a maintenance staff person increases, so too does the safety of the planes on which they work.

In order to improve safety, two incentive plans are being considered:

I. Increasing cash incentives paid out at the end of each year; or
II. Stock options based on years working with SEA, which can only be exercised when employees leave the company.

(e)   (*7.5 points*)

(i)   (*3.5 points*) Critique the problem definition to be solved by the proposed incentive plans. Justify your answer.

> ANSWER:

(ii)   (*3 points*) Compare and contrast the proposed incentive plans.

> ANSWER:

(iii)   (*1 point*) Recommend one of the proposed incentive plans. Justify your answer.

> ANSWER:

2. **Continued**

    (f)   (*3 points*) The consultant is asked for their input on the incentive plan. They note that SEA will likely need to rapidly increase its workforce over the next few years; they feel this growing workforce will really value up-front cash from SEA. The consultant recommends option I.

        (i)   Identify the decision style used by the consultant to gather and evaluate information. Justify your answer.

> ANSWER:

        (ii)   Identify the decision style used by the consultant to select the best alternative. Justify your answer.

> ANSWER:

3.

(*27 points*) Information on Big Ben Bank can be found in Section 5 of the Case Study.

Big Ben is considering providing financing under the solar energy subsidy program described in section 5.4 of the case study. Stakeholders of the program may be in 1 of 3 categories:

      I.   Capital market stakeholders
      II. Product market stakeholders
      III. Organizational stakeholders

(a)   (*3 points*) List the stakeholders that are in each category (I through III). Justify your answers.

> ANSWER:

3. Continued

Big Ben has developed a model to evaluate the investment.

Assume each annual loan repayment per $1,000 of financing is calculated as follows for each of the 20 years during which the financing is in place:

$$Payment = EEP \times RP \times U$$

Where (for any given year):

- EEP is units of the Excess Energy Production produced by the solar panels.
- RP is the Retail Price per unit of energy.
- U is an indicator variable denoting whether the Utilities companies participated in the program.
- EEP, RP, and U are independent of each other, and independent across time.

The model assumes the following probability distributions for the above variables, based on observed national averages from 5 years ago. This data is also provided in the Excel file for this question.

EEP (units)	Prob		RP ($/unit)	Normal		U (Yes/No)	Prob
25	5%		μ	0.55		Yes (U=3)	80%
50	20%		σ	0.20		No (U=1)	20%
75	50%						
100	20%						
125	5%						

(b) (*1 point*) Calculate the expected annual loan repayment. Show your work.

> ANSWER:

(c) (*2 points*) Calculate the standard deviation of the annual loan repayment. Show your work.

> *The response for this part is to be provided in the Excel spreadsheet.*

(d) (*2 points*) Explain why a simulation model is a useful tool to evaluate this investment.

> ANSWER:

3. **Continued**

You are provided simulated values in the same format as above, corresponding to each year in one scenario modelled by Big Ben. This data is also provided in the Excel file for this question.

Year	EEP	RP	U	Payment
Distribution	U(0,1)	N(0,1)	U(0,1)	N/A
1	0.80	(0.02)	0.12	
2	0.59	(1.20)	0.05	
3	0.44	(0.57)	0.34	
4	0.52	(0.41)	0.69	
5	0.24	0.86	0.58	
6	0.04	0.14	0.52	
7	0.24	1.82	0.08	
8	0.16	0.09	0.30	
9	0.74	(1.00)	0.33	
10	0.63	0.26	0.22	
11	0.68	0.74	0.90	
12	0.26	0.24	0.01	
13	0.26	(1.50)	0.65	
14	0.64	1.11	0.30	
15	0.55	0.29	0.32	
16	0.41	0.62	0.84	
17	0.99	1.09	0.83	
18	0.82	0.54	0.18	
19	0.66	(0.61)	0.03	
20	0.72	1.44	0.44	

(e)　　(*5 points*)

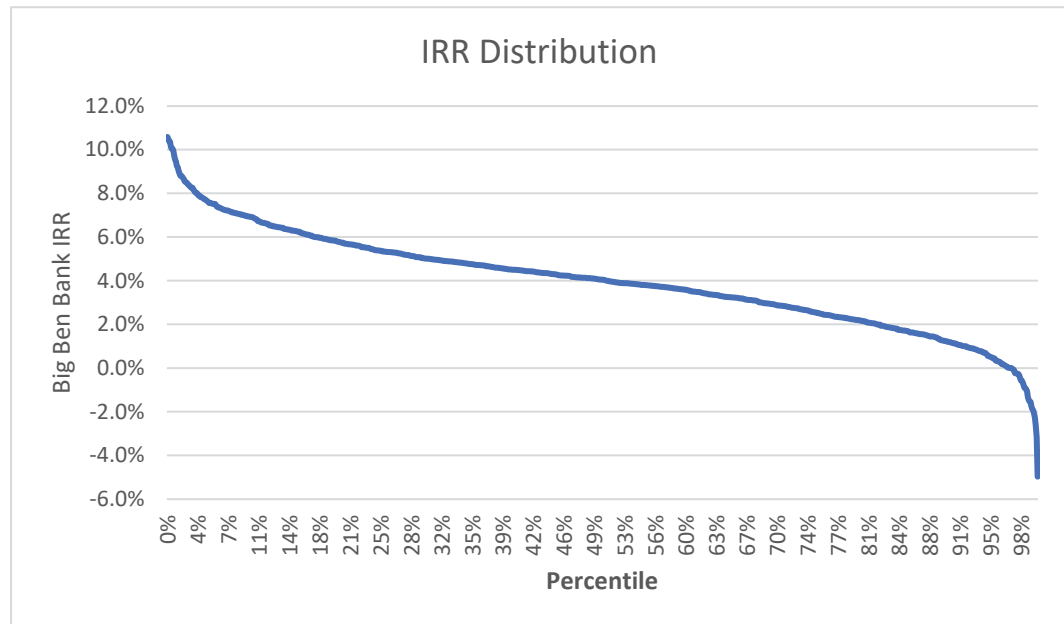(i)　　Calculate the simulated payment amount for each year in the above scenario.

The response for this part is to be provided in the Excel spreadsheet.

(ii)　　Calculate the Internal Rate of Return (IRR) to Big Ben with respect to the investment under this scenario.

The response for this part is to be provided in the Excel spreadsheet.

3. Continued

Your analyst repeats the above procedure over 1000 trials to construct the following IRR distribution:

(f) (*2 points*) Recommend two risk measures Big Ben should consider when evaluating this investment. Justify your recommendation.

> ANSWER:

(g) (*2 points*) Explain how the simulation output can be used to help Big Ben decide whether or not invest.

> ANSWER:

3. Continued

(h) (*3 points*) Assume no relevant factors have been omitted from the model.

   (i) Identify two shortcomings of the simulation model used by Big Ben.

   > ANSWER:

   (ii) Recommend two enhancements to the model that address your findings in part (i). Justify your recommendation.

   > ANSWER:

(i) (*3 points*) Assume the model ***does not*** capture all relevant factors:

   (i) Identify two additional factors Big Ben should consider in its analysis. Justify your answer.

   > ANSWER:

   (ii) Describe how each additional factor identified in part (i) could affect Big Bank's investment decision. Justify your answer.

   > ANSWER:

3.   Continued

You just had the following conversation with Big Ben's senior management.

> Senior Management: Hello, can you provide your evaluation of the investment?

> You: My analyst has run a simulation model to construct an IRR distribution; however, I believe there are some shortcomings in the model that need to be addressed before I can pass along the results.

> Senior Management: I'm sure your analysis is adequate, and we really need to reach a decision soon. Please e-mail me the IRR distribution by end of day today.

(j)   (*4 points*)

   (i)   Identify which direction of organizational communication is being used to communicate the simulation results. Justify your answer.

ANSWER:

   (ii)   Describe the two barriers to effective communication present in the dialogue. Justify your answer.

ANSWER:

   (iii)   Evaluate the choice of communication media that Big Ben's senior management has asked you to use to provide the results.

ANSWER:

4.

(*32 points*) Information on Blue Jay Tire (BJT) can be found in section 3 of the Case Study.

BJT is expecting an increase in vehicle production due to the transition to electric vehicles. This means that BJT will supply more tires to its distributors. BJT is expecting its customers to increase their total inventory of tires from 1 million to 1.2 million.

(a)   (*1 point*) Describe how the value chains for BJT and its rubber supplier are connected. Justify your answer.

> ANSWER:

(b)   (*1 point*) Explain oscillation and amplification in the context of stock management.

> ANSWER:

4.   Continued

You make the following assumptions:

- Customer tire stock is currently in a state of equilibrium.
- Average lifetime of a tire in inventory is 24 months.
- Time to manufacture, deliver and install a tire is 2 months.
- Age of tires currently in inventory is uniformly distributed.

(c)   (*2 points*)

(i)   Define steady state error.

ANSWER:

(ii)   Explain how to incorporate steady state error into stock management.

ANSWER:

(iii)   Calculate BJT's current steady state error.

ANSWER:

(d)   (*3 points*) Calculate the expected monthly inventory of BJT's customers for stock for 25 months, starting at month 0. Show your work.

The response for this part is to be provided in the Excel spreadsheet.

(e)   (*3 points*) Sketch a causal loop diagram to illustrate the relationship between the inventory of BJT's customers, their acquisition rate, and adjustment for stock.

ANSWER:

4.   **Continued**

(f)   (*3.5 points*)

(i)   (*1 point*) Calculate the amplification ratio.

> ANSWER:

(ii)   (*2 points*) Interpret the amplification ratio calculated in part (i) with respect to BJT's Risk Profile in Section 3.3 of the Case Study. Justify your answer.

> ANSWER:

(iii)   (*0.5 points*) Calculate the increase in rubber suppliers' production assuming that BJT's orders comprise about 5% of rubber suppliers' overall business and the amplification ratio is 5.

> ANSWER:

4. Continued

The assumption that every tire survives for an average of 2 years is being challenged.

(g)   (*3.5 points*)

(i)   Explain how the model results change if there is a random chance of failure instead, equal to 50% per year and tires last at most 4 years.

ANSWER:

(ii)   Explain how an aging chain can be incorporated into the model.

ANSWER:

(iii)   Describe the impact of an aging chain on the Desired Acquisition rate when the demand for tires increases. Justify your answer.

ANSWER:

(iv)   Describe the impact of an aging chain on the Desired Acquisition rate 10 years after the demand for tires increases. Justify your answer.

ANSWER:

4. **Continued**

A colleague who has worked on a supply chain model of airplanes does not consider amplification ratio because they take a long time to build and have a lifespan of 25 years.

(h) (*1.5 points*) Contrast the amplification ratio for airplanes and tires.

ANSWER:

(i) (*7.5 points*)

(i) (*5 points*) Explain how the change in demand for tires changes the Five Forces model where BJT is a supplier. Justify your answer.

ANSWER:

(ii) (*2.5 points*) Describe two specific actions that BJT may take to meet mitigate the challenges created by the change in demand for tires. Justify your answer.

ANSWER:

4. Continued

(j) (*6 points*) BJT wants to thank the customers who stay with them while stock levels adjust. They plan to make a $1 donation at the end of the 24 months for every tire purchased by each distributor during the 24 month period that inventory levels are adjusting.

Recall the three pillars of thanking customers:

    I. Type and amount
    II. Timing and frequency
    III. Sustainability

(i) Describe the three pillars (I through III).

> ANSWER:

(ii) Critique the proposed approach with respect to the three pillars.

> ANSWER:

(iii) Sketch a memo that informs customers of the customer appreciation program using a three-level pyramid structure. Label the vertical relationship between the point and subpoints.

> ANSWER:

END OF EXAMINATION